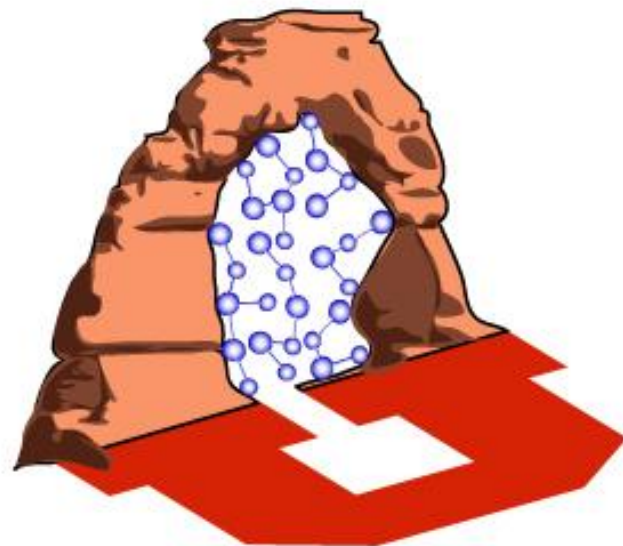


# Center for Therapeutic Biomaterials



Center for Therapeutic Biomaterials

*Director:*

**Glenn D. Prestwich, Ph.D.**

**Presidential Professor of Medicinal Chemistry**

*Associate Director:*

**Richard R. Orlandi, M.D.**

**Associate Professor of Surgery**

# CTB Leadership (2005-2006)

- ◆ **Glenn D. Prestwich, PhD, Director**

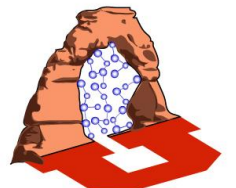
⇒ *Presidential Professor of Medicinal Chemistry; directed the Center for Cell Signaling, a graduated Utah Center of Excellence*

- ◆ **Richard R. Orlandi, MD, Associate Director**

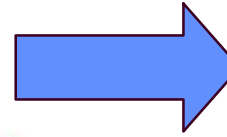
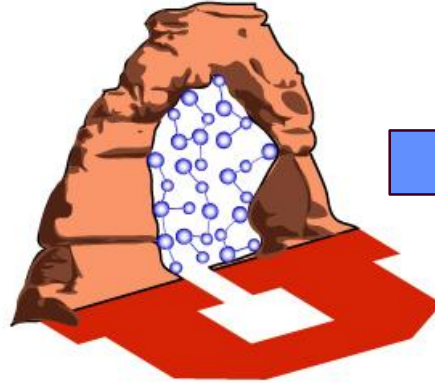
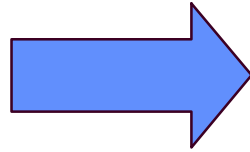
⇒ *Associate Professor of Surgery; Chief of Otolaryngology-Head and Neck Surgery, Salt Lake Veterans Affairs Medical Center*



- **Both active entrepreneurs and researchers personally involved in CTB technology development and commercialization**
- **Strong track record of achieving planned milestones**



# The Centers of Excellence Model



Center for Therapeutic Biomaterials

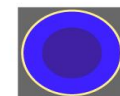
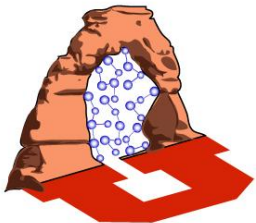


## Unmet Clinical Needs

- ◆ Chronic and Acute Wound Healing
- ◆ Cartilage and Bone Repair
- ◆ Prevention of Post-surgical Adhesions
- ◆ Reconstruction of Tissues and Organs
- ◆ Personalized Medicine

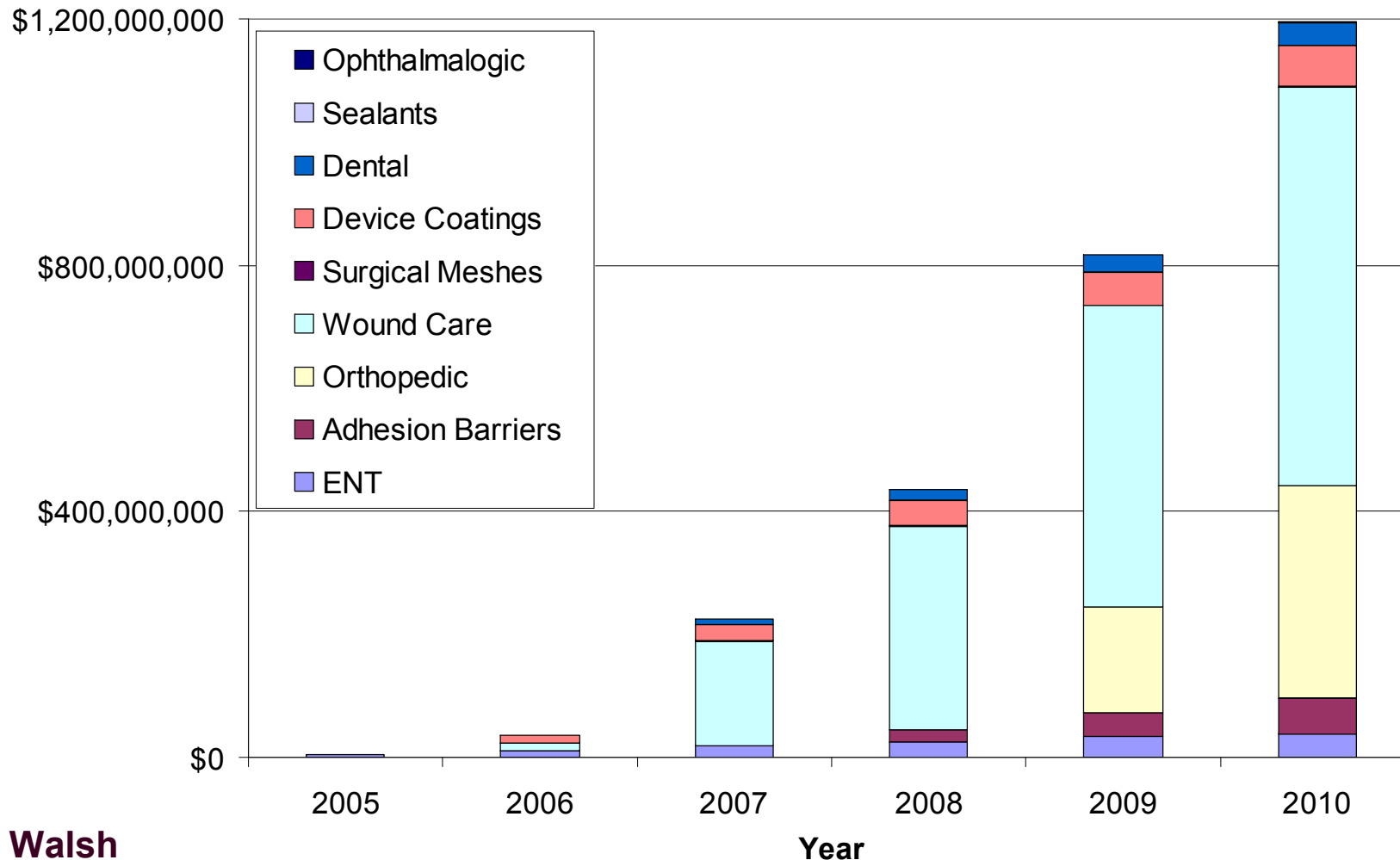
# A Brief History of Sentrx Surgical, Inc.

- ◆ Founded in 2004 by **G. D. Prestwich** with ENT surgeons **R. R. Orlandi, MD, A. Park, MD, and R. K. Koehn** as CEO
- ◆ **Phase I STTRs** for ENT devices and crosslinker chemistry
- ◆ **Two VC investments** in advanced negotiations
- ◆ **Alliance term sheets** with major manufacturers and distributors
- ◆ **Fast-to-market products**
  - ⇒ Unregulated cosmetic and research markets - Q4 2005
  - ⇒ Sinus device - Q2 2006
  - ⇒ Eardrum device - Q2 2006
  - ⇒ Adhesion device - Q4 2007

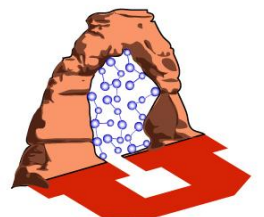


# Commercial Opportunities - Medical Devices

Projected Revenue From Medical Device Market

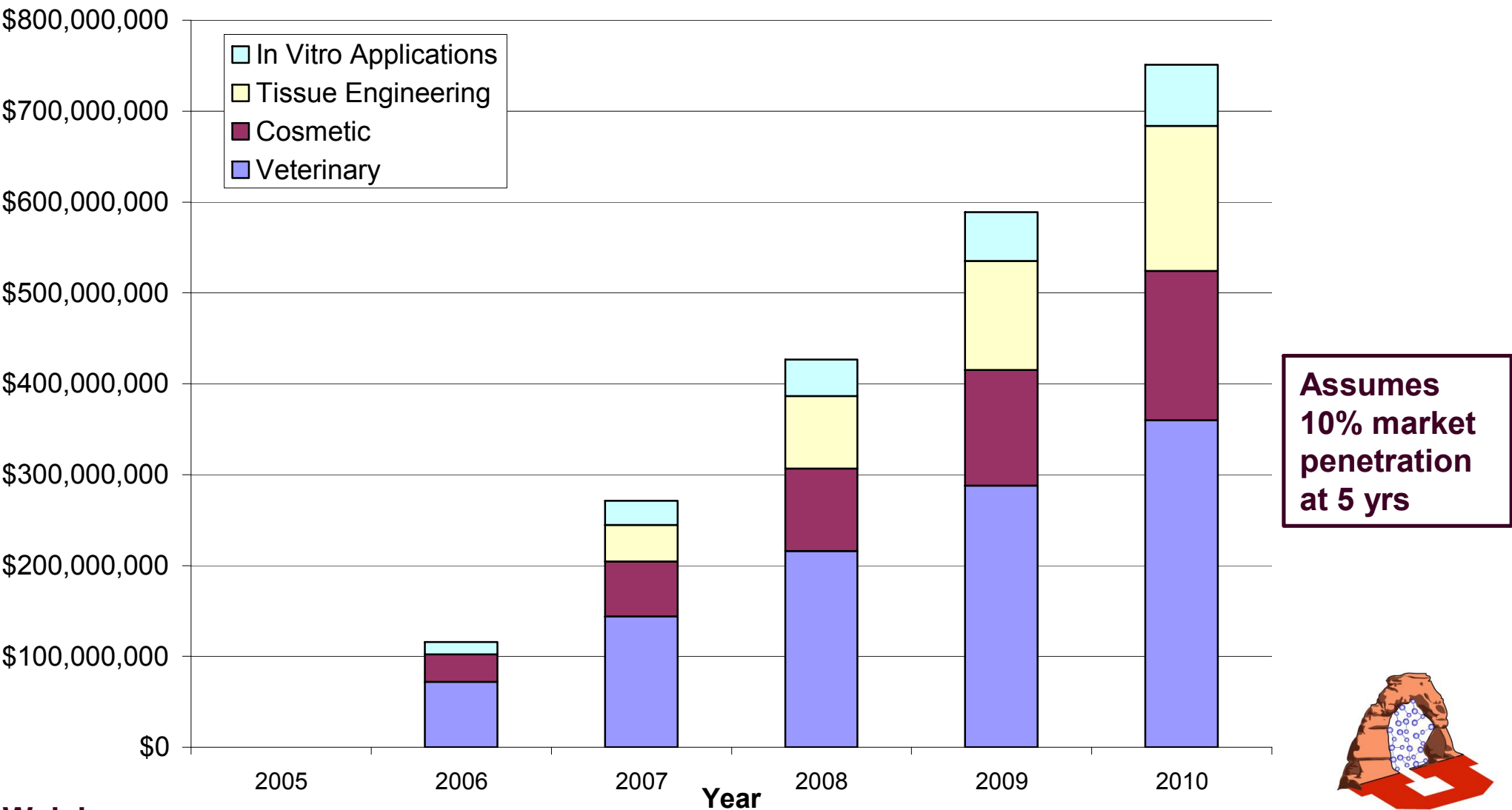


**Assumes  
10% market  
penetration  
at 5 yrs**



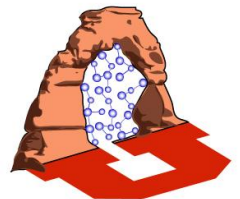
# Commercial Opportunities - Non-Medical Devices

Projected Revenue From Non-Medical Device Products



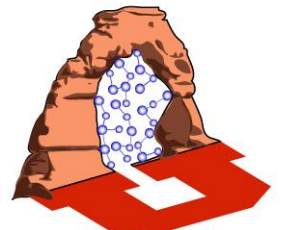
# CTB Program Overview

- ◆ CTB will discover new technologies
- ◆ CTB will validate fast-to-market biomaterials
- ◆ CTB will accelerate licensing and company launches
- ◆ CTB has keys to success
  - ✓ **Team** - entrepreneurs, scientists, clinicians
  - ✓ **Technology** - platforms at different stages
  - ✓ **Timing** - urgent medical needs addressed
  - ✓ **Traction** - productive collaborations in place



# Year Two Financial Plan for CTB

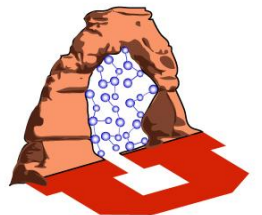
- ◆ **COEP funds requested = \$ 160,000**
- ◆ **Extramural matching funds exceed \$1,500,000**
  - ⇒ \$698,000 claimed for Year One
  - ⇒ Ongoing basic CTB faculty research in cardiac adhesions, blood vessel growth, anticancer drug discovery, implantable devices, and vocal fold repair
- ◆ **Research contracts from Utah start-ups**
  - ⇒ \$180,000 in Year One from Sentrx/NIH
  - ⇒ \$750,000 anticipated in Year Two from Sentrx



# Translational Importance of COEP Funding

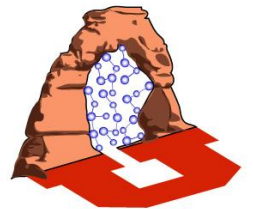
- ◆ **Support for discovery of new intellectual property**
- ◆ **Supports research to validate commercial potential**
- ◆ **Provides leverage for additional federal and corporate dollars**
- ◆ **Enables business development to exploit commercial opportunities**

**None of this would be possible with basic research funds from NIH or applied research funds from industry.**



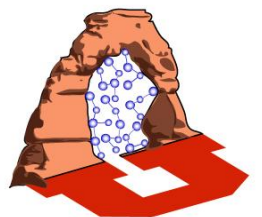
# Economic Impact for the State of Utah

- ✓ **CTB creates new jobs and start-up companies**
- ✓ **CTB attracts new federal research dollars**
- ✓ **CTB has high visibility innovations in biomaterials**
  - ✓ Stoel Rives nomination for Sentrx
  - ✓ 2 VSpring Top 100 Venture Entrepreneurs
  - ✓ Invited expert to SF bay area VC firm
- ◆ **Patient accrual for clinical trials in Utah**
- ◆ **Royalty and licensing revenues to UUtah**
- ◆ **Home-grown companies will grow and expand in Utah**



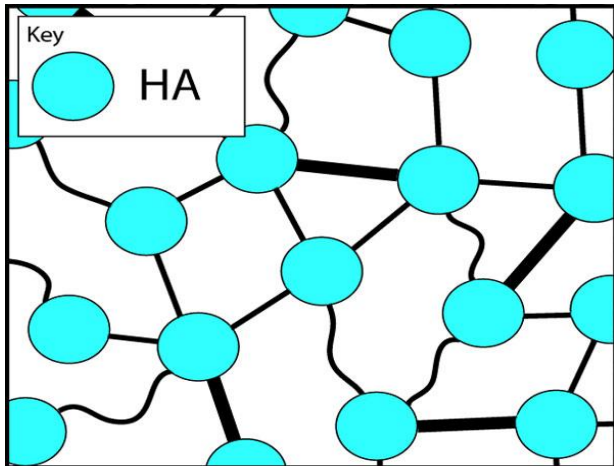
# CTB Faculty Associates

- ◆ **David Bull, MD** - myocardial repair
- ◆ **Chris M. Ireland, PhD** - anticancer drug evaluation
- ◆ **Leigh A. Neumayer, MD** -post-surgical adhesion clinical trials
- ◆ **Marga Massey, MD** -reconstructive plastic surgery
- ◆ **Albert Park, MD** - pediatric otology applications
- ◆ **Marshall E. Smith, MD** - airway stenting
- ◆ **Susan L. Thibeault, PhD** - vocal fold repair
- ◆ **Glenn D. Warden, MD, MBA** - wound healing, burn treatment



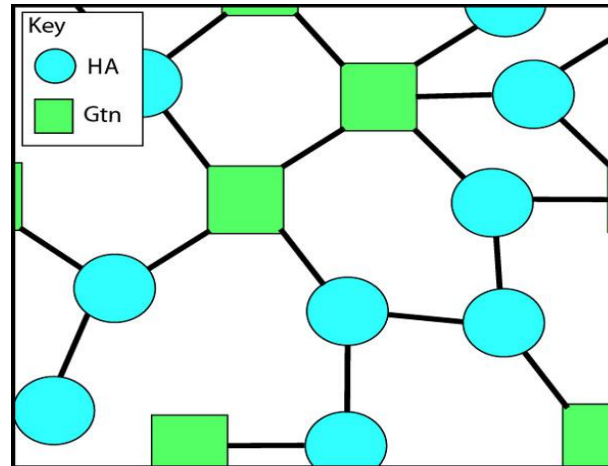
# CTB Technology: A Synthetic Extracellular Matrix (sECM)

## Scar-Free Healing



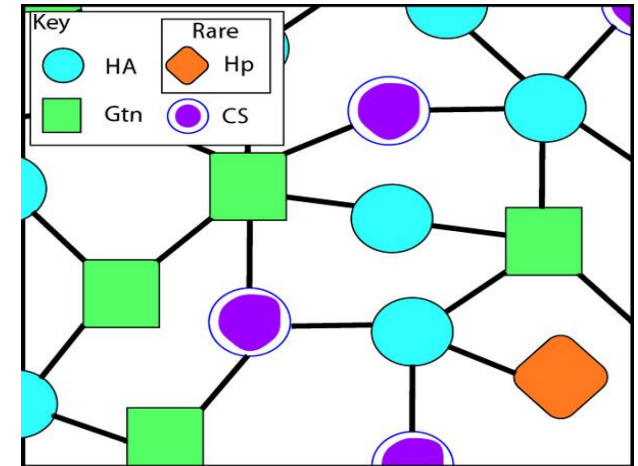
- Sinus surgery
- Adhesion prevention

## Tissue Engineering and Repair

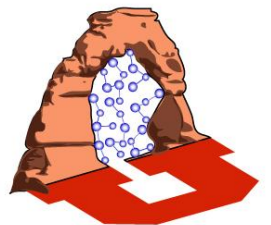


- Bone and cartilage repair
- Eardrum repair
- Reconstructive surgery

## Multi-Functional

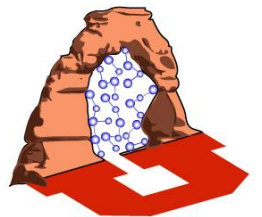


- Chronic wound healing
- Growing new blood vessels



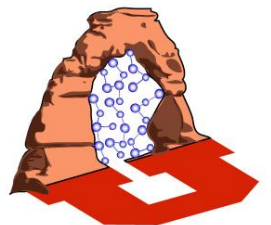
# CTB Intellectual Property Status

- ◆ **Sentrx Surgical has pending license to current CTB-based sECMs**
- ◆ **CTB proposes two approaches:**
  - ⇒ **Validate new fields of use for current sECMs**
  - ⇒ **Develop new chemistries and new IP**
- ◆ **CTB's new chemistries expand capabilities of current sECMs**
  - ⇒ **Make sterilized materials faster and cheaper**
  - ⇒ **Make elastic materials that crosslink without tissue damage**
  - ⇒ **Control gelation with light-reactive crosslinkers**



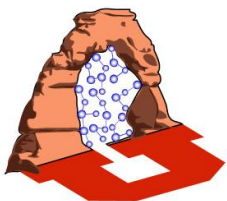
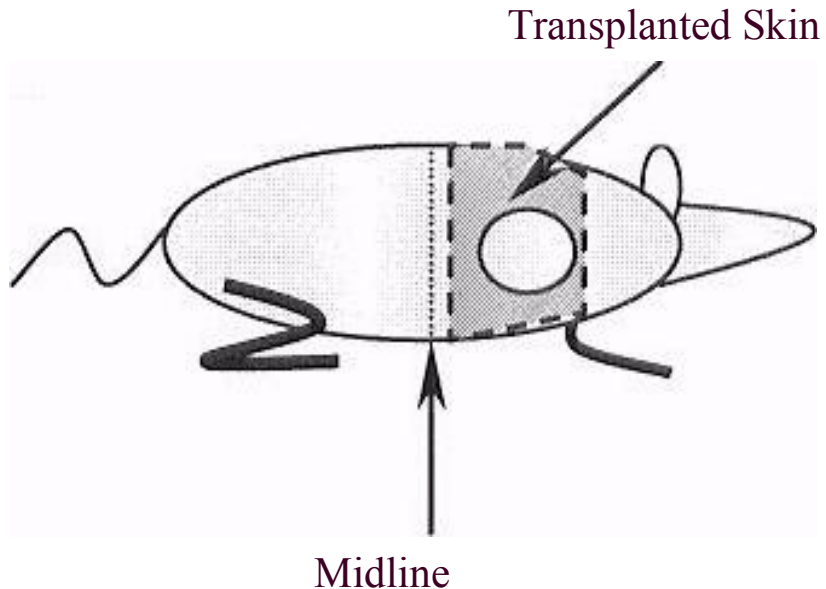
# 3-D Cell Culture and Personalized Medicine

- ◆ Human liver cells for drug testing
- ◆ Human fat-derived stem cells for breast and facial reconstruction (IRB)
- ◆ Commercialize uses in research and toxicology testing
- ◆ Use “personalized” mice with patient-derived normal and tumor cells to optimize patient treatment



# CTB Technology Extends Shelf Life of Donated Skin

- ◆ Skin transplantation now limited to 10 days after harvest
- ◆ *Remarkable Results:* In supplemented medium, 24-day-old skin is almost as good as new!

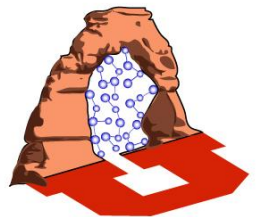


# Biomaterials for Bone and Cartilage Repair

- ◆ Over 1 million hospitalizations per year in U.S. from bone fractures
- ◆ Over 36 million Americans suffer from arthritis
- ◆ Over 20 million spinal fusions and osteoporosis treatments annually
- ◆ Over 500,000 cartilage repairs per annum

## **CTB Approach:**

**Use sECM devices to accelerate bone and cartilage growth**

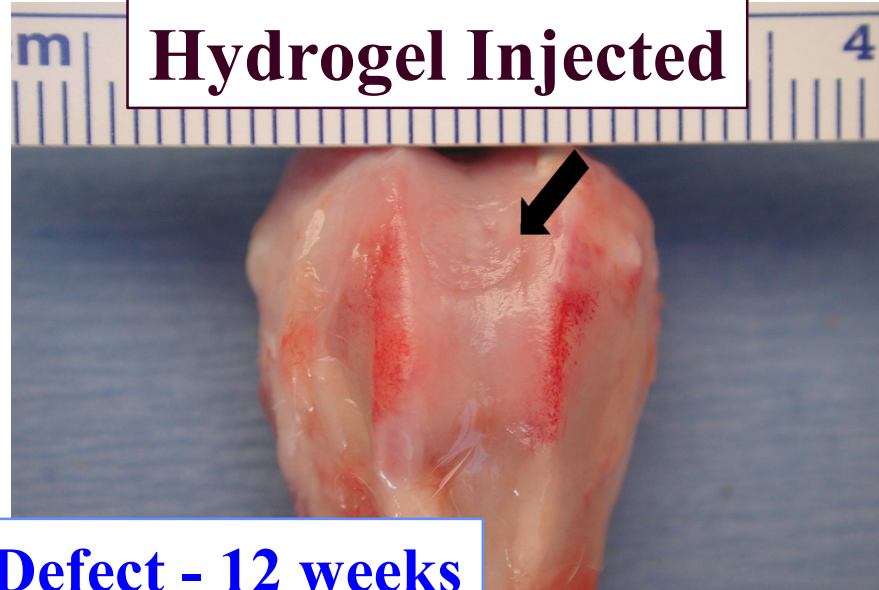


# Cartilage Repair with Injectable Hydrogel

**No Treatment**



**Hydrogel Injected**

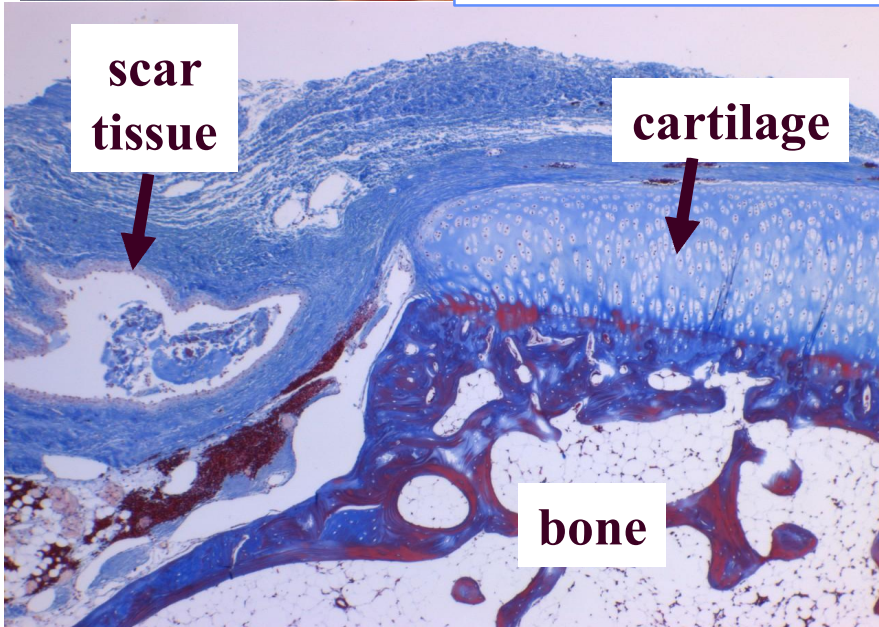


**Rabbit Patellar Defect - 12 weeks**

**scar  
tissue**

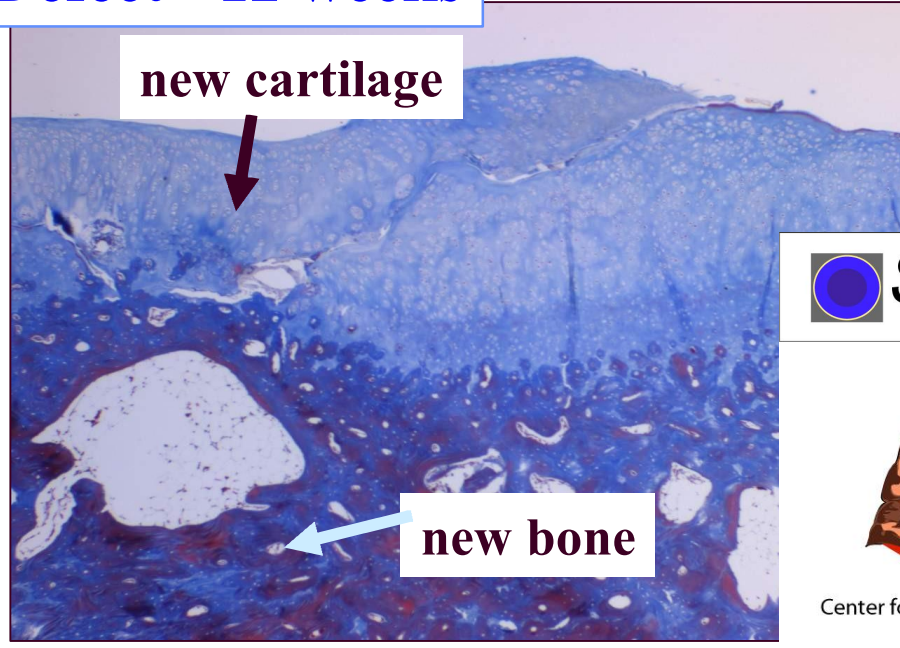
**cartilage**

**bone**

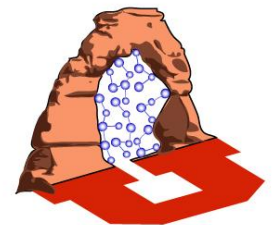


**new cartilage**

**new bone**



 **SENTRX**  
surgical



Center for Therapeutic Biomaterials

# The Problem of Post-surgical Adhesions

## ◆ Surgical adhesions

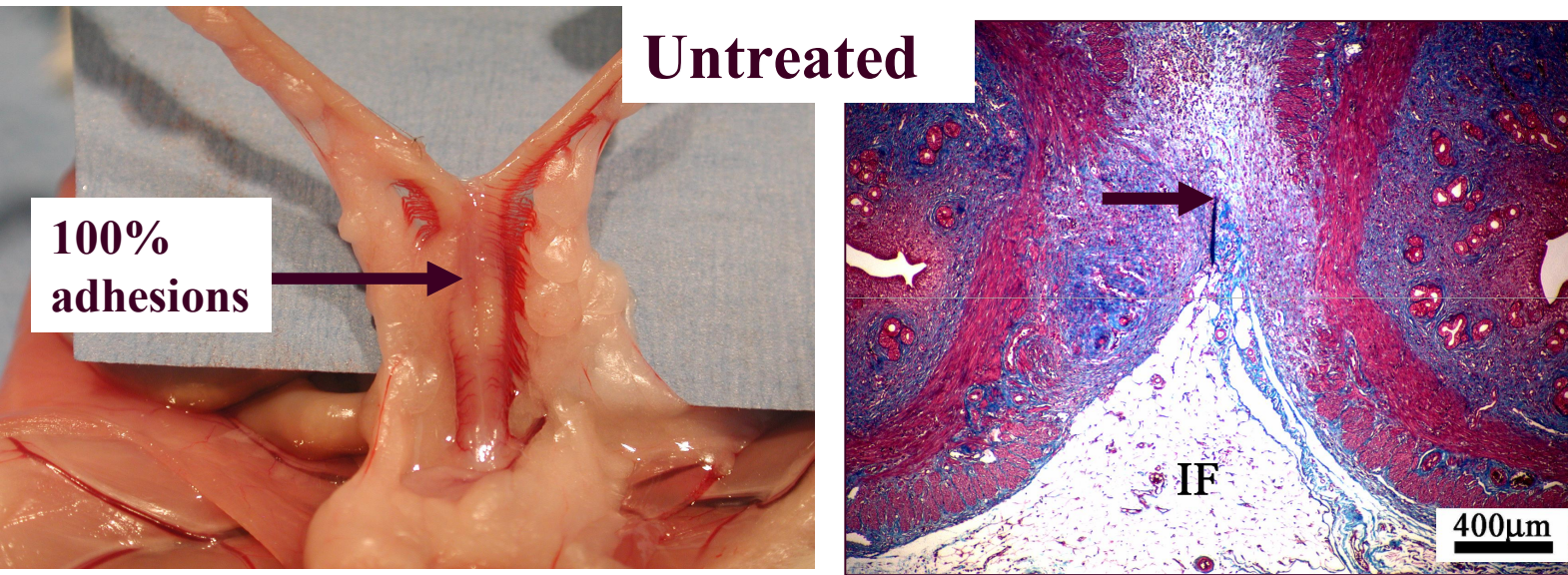
- ⇒ Cause painful bowel obstructions and complicate 2nd surgeries
- ⇒ Cost for abdominal & thoracic surgeries > \$4 billion/yr in US

## ◆ Current HA product

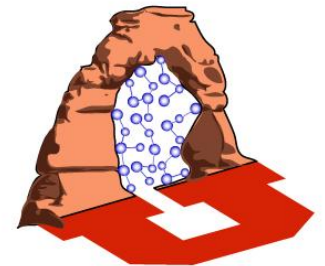
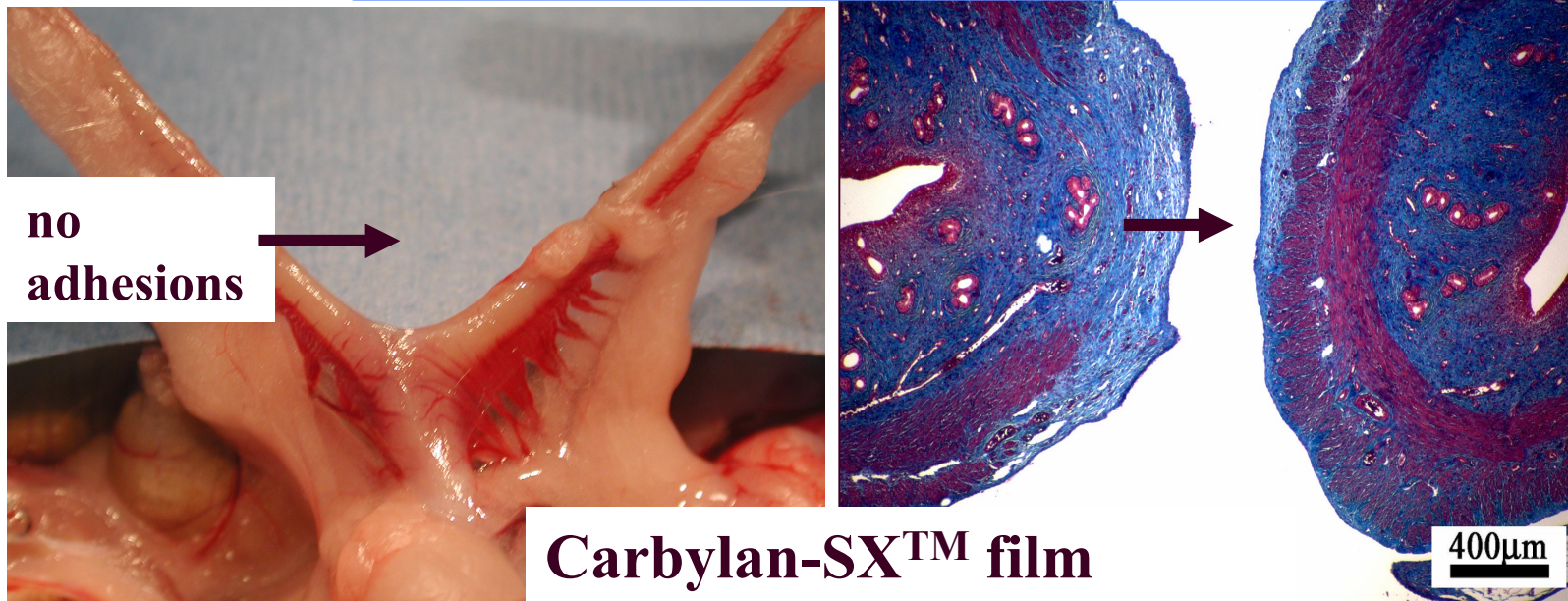
- ⇒ Genzyme's Seprafilm™
- ⇒ Disliked by surgeons - not moldable, not effective, hard to use

## ◆ Unmet need - materials that are moldable, 100% effective, and easy to use

# Crosslinked Hydrogels Prevent Adhesions



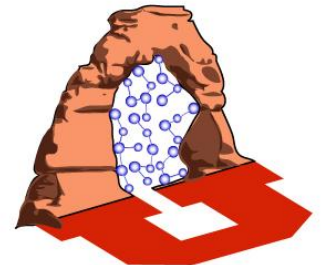
**Rat uterine horn - 2 weeks**



# Chronic Wound Healing

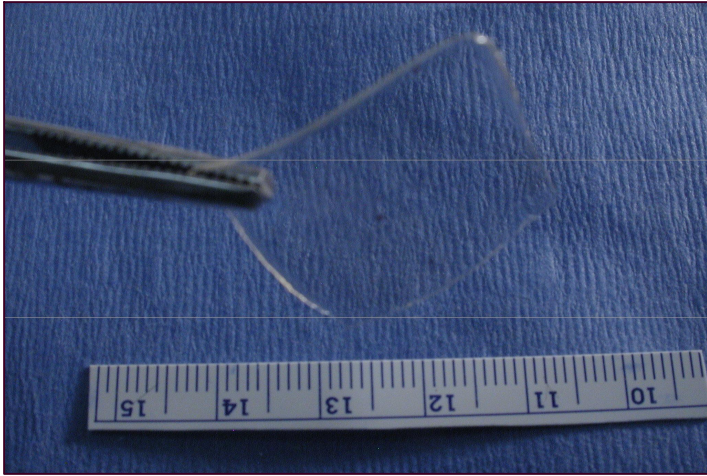
*A growing problem in aging and diabetic populations*

*Market potential exceeds \$1 billion/year*

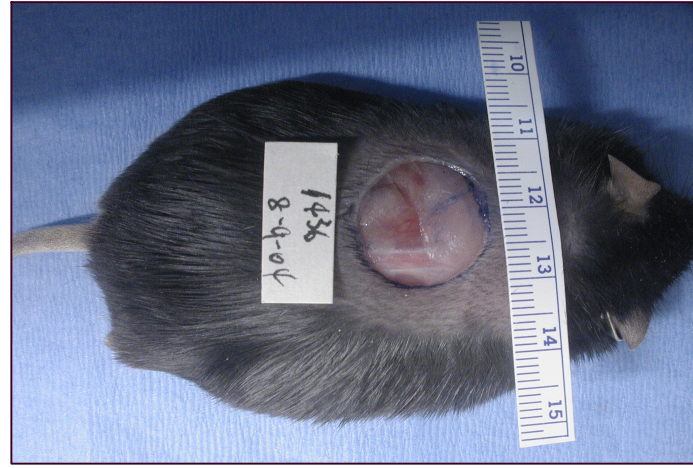


Center for Therapeutic Biomaterials

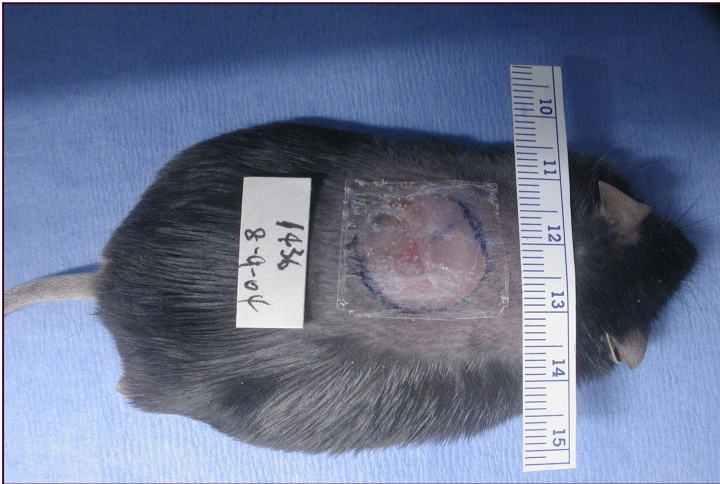
# Chronic Wound Model: Healing in the Diabetic Mouse



**sECM Films with good elasticity**



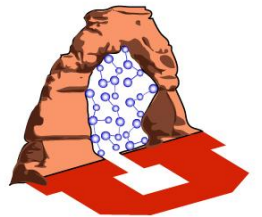
**1.6 cm full-thickness wound**



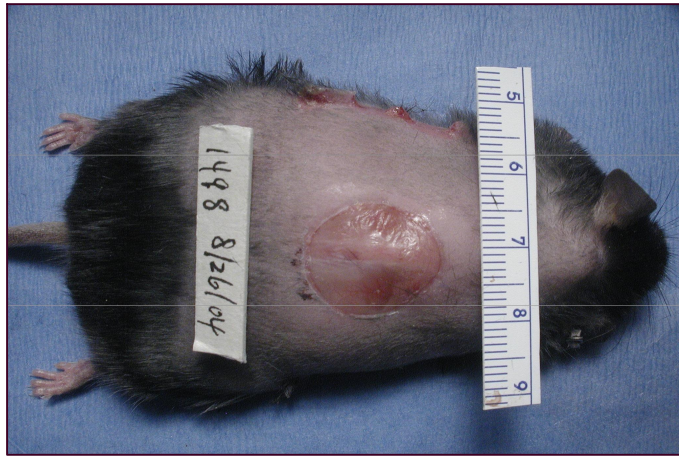
**Apply experimental film to wound and seal**



**Wrap wound with bandage**



# Hydrogels Plus Growth Factors Heal Chronic Wounds in 2 Weeks!



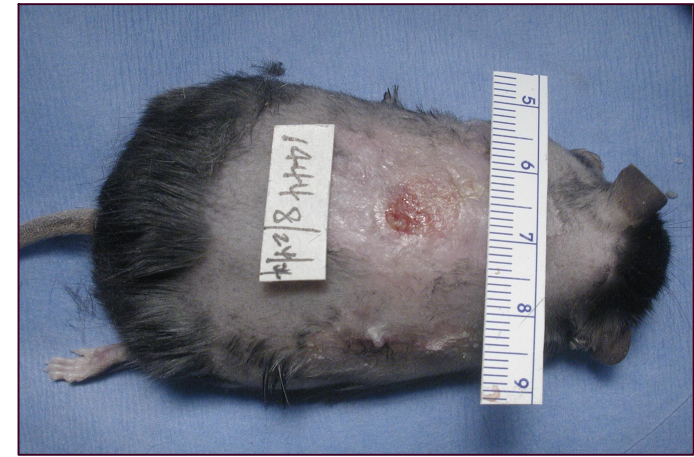
**Untreated**

21% Healed



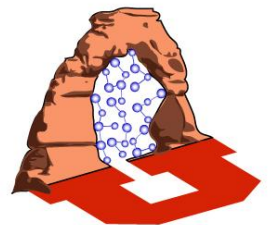
**CS-bFGF (2 ug)**

53% Healed



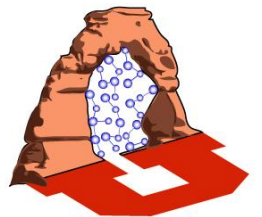
**CS-HP-bFGF (20 ug)**

95% Healed

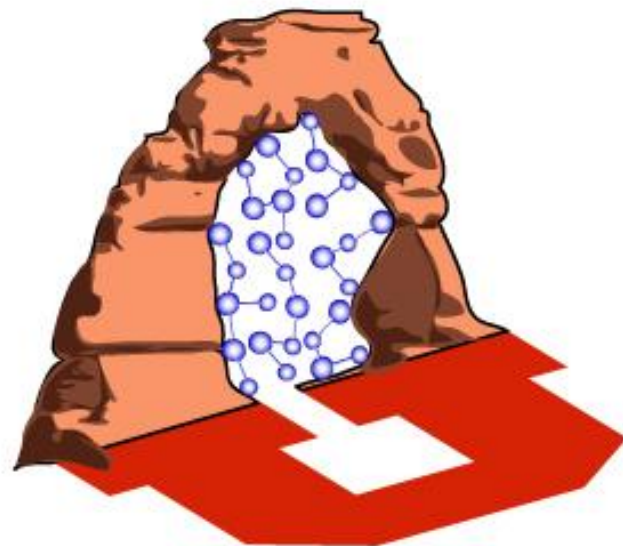


# Technical Milestones for 2005

- ◆ **Develop patentable new polymer chemistry**
- ◆ **Evaluate new biomaterials with cells and in animals**
- ◆ **Employ sECMs for growing normal cells in 3-D**
- ◆ **Validate sECMs for anti-cancer drug evaluation in animals**
- ◆ **License materials to extend skin life for transplantation**
- ◆ **Create hybrid biomaterials for bone repair**



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